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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/696,394	10/28/2003	Samantha S. H. Tan	10892	6372

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DUGAN & DUGAN, P.C.
55 SOUTH BROADWAY
TARRYTOWN, NY 10591

EXAMINER	
SONG, MATTHEW J	
ART UNIT	PAPER NUMBER
1722	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/03/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/696,394	TAN, SAMANTHA S. H.	
	Examiner	Art Unit	
	Matthew J. Song	1722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 January 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 6-21, and 27-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tan (WO 02/15255 A1) in view of Uehara et al (US 6,199,563).

In a method of cleaning semiconductor parts, note entire reference, Tan teaches a cleaning solution for cleaning parts includes 0.5-1.5 wt% Hf; 0.1-0.5 wt% HNO_3; and 1-10 wt% H_2O_2 for cleaning SiC ceramic parts (pg 7, ln 1-25). Tan also teaches a solution of HF/HNO_3 or HCl/HNO_3 at a concentration of 10-40 wt% for each chemical (pg 7, ln 25-32). Tan also teaches SiC can be found in chamber roofs, domes, rings and collars (pg 9, ln 1-10). Tan also teaches an ultrasonication cleaning process to a surface of a part can be cleaning, spray rinsing the part with a dilute chemical mixture, and spray rinsing the part with deionized water (pg 15, ln 30 to pg 16, ln 5). Tan also teach an ultrasonication step in deionized water (pg 21, ln 1-10) and an ultrasonication step in a chemical bath (pg 22, ln 1-32).

Tan teaches ultrasonication for quartz part, but is silent to the use of ultrasonication for SiC parts. Tan also does not teach an integrated system that is adapted for handling a multiplicity of silicon carbide materials.

In a method of processing a semiconductor, Uehara et al teaches a method of preventing partical contamination in cleaning and etching process (col 1, ln 40-55). Uehara et al teaches increasing the cleaning efficiency by supplying ultrasonic waves while rotating the substrate (col 1, ln 10-25 and col 9, ln 50-65). Uehara et al also teaches the etching time is shortened because etching is promoted by ultrasonic waves (col 9, ln 60-67). Uehara et al also teaches an ultrasonic bath **30**, an ultrasonic source **31** and a wafer holder **41** for holding a plurality of wafers. The wafer holder clearly suggests applicant's system that is adapted for handling a multiplicity of silicon carbide materials during cleaning because a plurality of substrates can be treated simultaneous by using the holder.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Tan by applying ultrasonic waves to the aqueous solution and the DI rinse while using a holder, as taught by Uehara et al to reduce the amount of contamination particles and to improve efficiency.

Referring to claim 6, Tan teaches chemical and mechanical process are applied to the part (pg 13, ln 1-20). The mechanical processes would read on applicant's scrubbing.

Referring to claims 7-8, Tan teaches a dilute chemical solution (abstract).

Referring to claim 9, Tan teaches HF/HNO_3 solution at concentrations of 10-40 wt% (pg 7, ln 15-30).

Referring to claims 9-18, 30, and 33, the combination of Tan and Uehara et al does not teach all of the claimed ranges for temperature, power and frequency. These variable are result effective variable. Therefore, It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan and Uehara et al by optimizing the

temperature, power and frequency to obtain the claimed ranges by conducting routine experimentation of a result effective variable (MPEP 2144.05).

Referring to claim 27-28 and 31-32, Tan teaches a dilute HF and HNO_3 solution with concentration that overlap the claimed ranges (Abstract).

Referring to claim 29, Tan teaches HF/HNO_3 at much higher concentrations 10-40 wt% (pg 7, ln 20-32), overlapping ranges are held to be obvious (MPEP 2144.05).

Referring to claim 19, Tan teaches purge drying with in filtered N_2 and under a heat lamp for at least 1 hour (pg 23, ln 20-31) and heating in a furnace to 800°C and cooling to 200°C (pg 20, ln 10-25), this clearly suggests applicant's baking.

Referring to claim 20, the combination of Tan and Uehara et al teaches cooling to 200°C from 800°C, this clearly suggests applicant's baking using 200-300°C.

Referring to claim 21, the combination of Tan and Uehara et al does not teach the claimed baking time. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan and Uehara et al optimizing the time to obtain the claimed time to optimize the time required ensure the wafers are dry.

Referring to claims 34 and 36, the combination of Tan and Uehara et al teaches plastics, such as polyethylene (col 2, ln 45-65), this clearly suggests high density polyethylene.

Referring to claim 35, the combination of Tan and Uehara et al is silent to robotic mechanisms. The provision of a mechanical or automated means to replace a manual activity was held to have been obvious (*In re Venner* 120 USPQ 192 (CCPA 1958); *In re Rundell* 9 ISPQ 220 (CCPA 1931). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan and Uehara et al by providing a robotic

mechanism to automate the process. Furthermore, robots are well known in the art to be used in the moving of substrates from an etching bath, to a rinsing bath and to a drying process, as evidenced by Lee (US 6,083,320) in column 1, lines 20-35.

Referring to claim 37-40, the combination of Tan and Uehara et al does not teach a system is adapted to hold lift pins or showerheads. Changes is shape are held to be obvious (MPEP 2144.04). The combination of Tan and Uehara et al teaches etching semiconductor components, which would include lift pins and showerheads; therefore adapting the system to handle lift pins would have been obvious to a person of ordinary skill in the art.

Referring to claim 41, duplication of parts is held to be obvious (MPEP 2144.04).

Referring to claim 42, pumps and manifolds are well known in the art and would have been obvious to a person of ordinary skill in the art.

3. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tan (WO 02/15255 A1) in view of Uehara et al (US 6,199,563) as applied to claims 1, 6-21, and 27-42 above, and further in view of Applicant's admitted prior art (AAPA).

The combination of Tan and Uehara et al teach all of the limitations of claims 2-3, as discussed previously, except a CVD SiC and a sintered SiC.

AAPA teaches several forms of silicon carbide materials used in the manufacture of semiconductor wafers, such as silicon carbide pins used as lift pins, wafer rings, and showerheads. AAPA also teaches lift pins, wafer rings and showerheads can be may be either sintering or CVD (pg 1, ln 15-25).

The combination of Tan and Uehara et al teach a process used for cleaning semiconductor equipment part made of SiC and are not particular to any particular type of SiC. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan and Uehara et al by using CVD or sintered SiC parts since both are used as equipment in semiconductor manufacturing, as taught by AAPA. Selection of a known material based on its suitability for its intended purpose is held to be obvious (MPEP 2144.07).

4. Claims 4-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tan (WO 02/15255 A1) in view of Uehara et al (US 6,199,563) as applied to claims 1, 6-21, and 27-42 above, and further in view of Kitabatake (US 6,273,950).

The combination of Tan and Uehara et al teach all of the limitations of claim 4, as discussed previously, except the act of oxidizing the silicon carbide material.

In a method of a manufacturing a silicon carbide device, note entire reference, Kitabatake teaches heating a silicon carbide material in an oxygen atmosphere to from a silicon dioxide thin film on the silicon carbide crystal surface at 1100°C, and etching the silicon dioxide film form on the surface to prepare a clean SiC surface (abstract and col 16, ln 35-65).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan and Uehara et al by oxidizing the silicon carbide material to form a useful silicon carbide device, as taught by Kitabatake.

Referring to claim 5, Kitabatake teaches 1100°C. Also, temperature are obvious to optimize (MPEP 2144.05).

5. Claims 22-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tan (WO 02/15255 A1) in view of Uehara et al (US 6,199,563) as applied to claims 1, 6-21, and 27-42 above, and further in view of Lu et al (US 6,352,081) or Laube (US 5,660,640).

The combination of Tan and Uehara et al teach all limitation for claim 22, as discussed previously, except the type of oven used.

In a method of cleaning semiconductor components, note entire reference, Laube teaches components are rinsed in deionized water and then are blown dry with filtered nitrogen and are subjected to a baking step for up to 3 hours in an oven having a nitrogen stream flowing therethrough. A baking temperature of 235-275 °F is used (col 5, ln 55 to col 6, ln 5). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan and Uehara et al by using a nitrogen purge oven, as taught by Laube, because nitrogen purge oven are conventionally used in the art to dry components after a DI water rinse. Other types of furnaces are known in the art which are capable of drying substrates after rinsing would have been obvious to a person of ordinary skill in the art.

In a method of processing a semiconductor device, note entire reference, Lu et al teaches wafers are a deionized water rinse step is followed by a convection oven bake at 120°C for 2 hours (col 9, ln 20-45). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan and Uehara et al by using a convection oven, as taught by Lu et al, because convection ovens are conventionally used in the art to dry components after a DI water rinse. Other types of furnaces are known in the art and would have been obvious to a person of ordinary skill in the art.

Referring to claim 26, pressure is well known in the art to be a result effective variable. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Tan, Uehara et al and Lu et al or the combination of Tan, Uehara et al and Laube et al by optimizing the pressure to obtain the claimed pressure by conducting routine experimentation.

Response to Arguments

6. Applicant's arguments filed 1/9/2007 have been fully considered but they are not persuasive.

Applicant's argument that Tan does not discloses both ultrasonicating silicon carbide in an aqueous solution and ultrasonicating in deionized water is noted but is not found persuasive. Tan broadly teaches cleaning a part by performing a ultrasonication cleaning process, note claim 10) and Tan also teaches the cleaning of ceramic parts, which includes SiC using aqueous solutions (page 7, lines 13-32). Tan does not explicitly teach ultrasonication of silicon carbide parts, however the use of ultrasonication is clearly suggested. Tan's broader teaching is for ultrasonication cleaning of semiconductor parts, which includes silicon carbide. Uehara et al generally teaches ultrasonication and the benefit of ultrasonication is etching time is shortened and uniform, while a substrate is hardly contaminated with particles (col 9, ln 55-67). Uehara et al is a general teaching and is not limited to any particular material, thus one of ordinary skill in the art would have found it obvious to use the teaching as motivation for applying ultrasonication to the method of Tan. Furthermore, ultrasonication of silicon carbide parts is well known in the art, as evidenced by Otsuki et al (US 6,419,757) in column 15, line 60 to column 169, line 10. The benefits of ultrasonication cleaning are obtained regardless if the material is quartz, silicon

or silicon carbide, thus it would have been obvious to one of ordinary skill in the art to apply ultrasonication to a SiC part using Tan's cleaning method.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Otsuki et al (US 6,419,757) teaches a silicon carbide is cleaned while ultrasonic virbration is applied to an aqueous solution so that dissolution of impurities at the surface and in the vicinity of the surface is promoted by the physical vibration applied to the material to be cleaned.

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J. Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra Gupta can be reached on 571-272-1316. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Matthew J Song
Examiner
Unit 1722

YOGENDRA N. GUPTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

MJS
March 26, 2007